



# Transmission Data

or

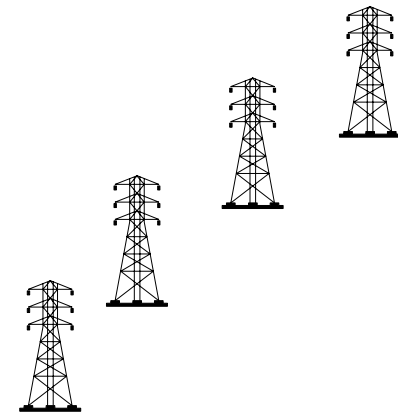
“How I Learned to Stop Worrying and Love Simplifying Assumptions”

Presentation to the National Renewable Energy  
Laboratory’s Energy Collaborative

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California Energy Commission







# Who Are You?

- Electricity Modeling?
- Production Cost/System Dispatch?
  - NERC Sub-region?
  - State?
  - Control Area(s)?
  - Utility(ies)?
- Load flow/OPF modeling?
- National (macro, input-output, CGE)?
- Packaged data from vendors?



# You Can Leave Now if You are a Transmission Planner

- Load flow data sets for NERC sub-regions compiled by Coordinating Councils
- Data overkill needed for studies
  - Interconnection of new plant(s)
    - Can I get energy to load under extreme conditions?
    - Will existing generators be affected?
  - Local area reliability
    - How much capacity must be available in a transmission-constrained area to withstand system component failures?

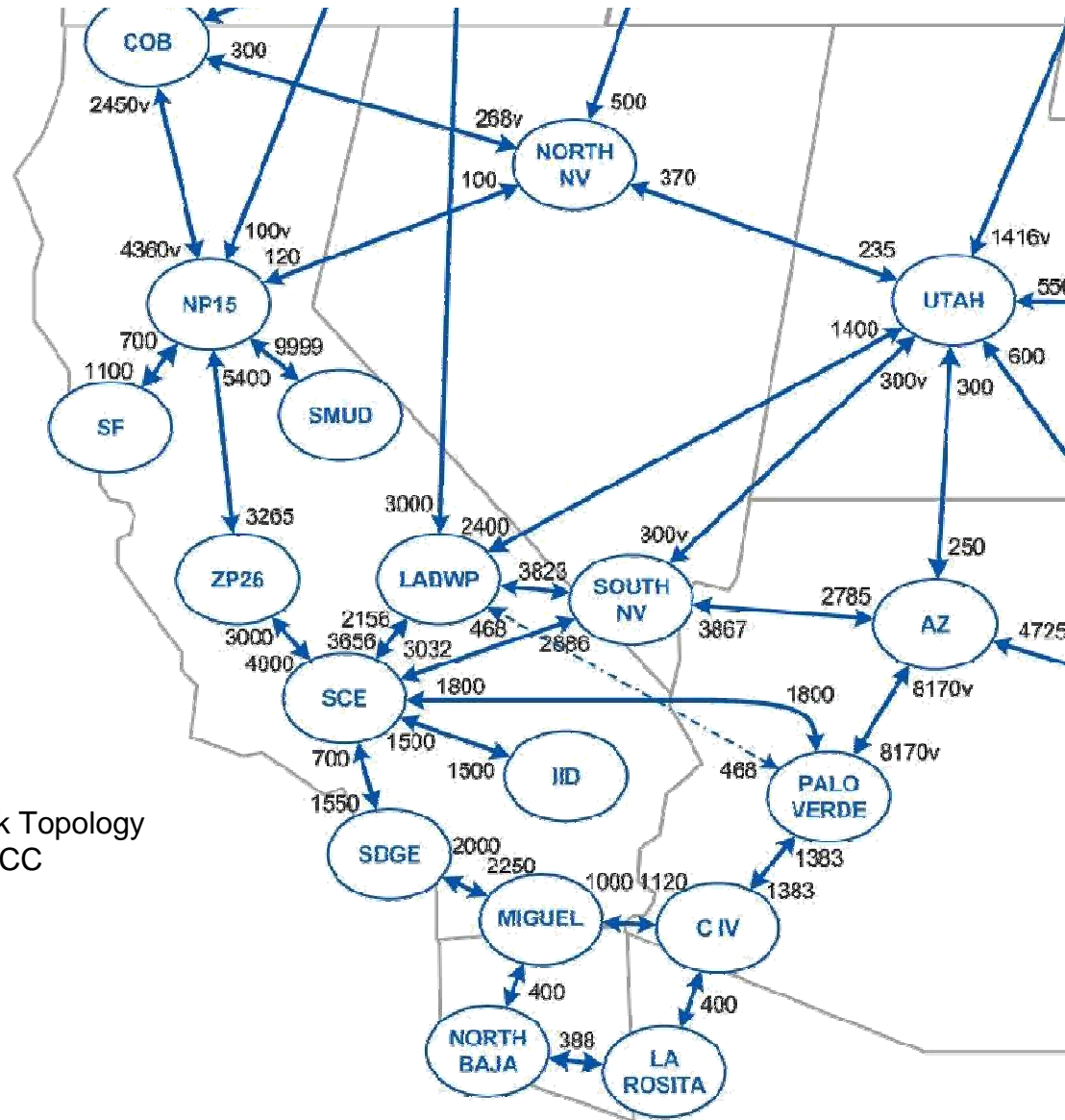


# FAQs

- How many MW can I move from A to B? How many MW will I be able to move from A to B in the future?
- How many MW actually move, have moved in the past, from A to B?
- Is the demand to move MW from A to B greater than the available transmission capacity?
- What the he\*\* are A and B?



# A, B, C, D, E, F, G....



CEC's Network Topology  
for WECC



# How many MW can flow from A to B?

- WECC publishes TTCs for a specified topology
- TTCs for other topologies are available from vendors of models, consulting firms
- Utilities are likely to have developed topologies and associated TTCs.
- Little or no development by public agencies
  - PUCs (PSCs), tend not to undertake modeling
  - CEC, NWPCC are the only two public entities in the WECC doing so



# Punch Line

- Studies requiring transmission data tend to be (NERC sub-) regional or of smaller areas;
- Few of these studies are performed by or for other than utilities; highly technical studies performed by CAOs, regional or ad hoc transmission planning groups
- As a result, broad databases are vendor-provided
  - minimal incentive to update, customize
  - proprietary



# How many MW can flow from A to B?

- (Dis)aggregation of TTCs not straightforward
  - TTCs may vary by load conditions, location and operation of generation
- Highly technical nature of transmission analysis, limited demand outside utilities means data will come from either:
  - Vendors/consulting firms
  - Utilities through regulatory agencies



## How many MW will be able to flow from A to B in the future?

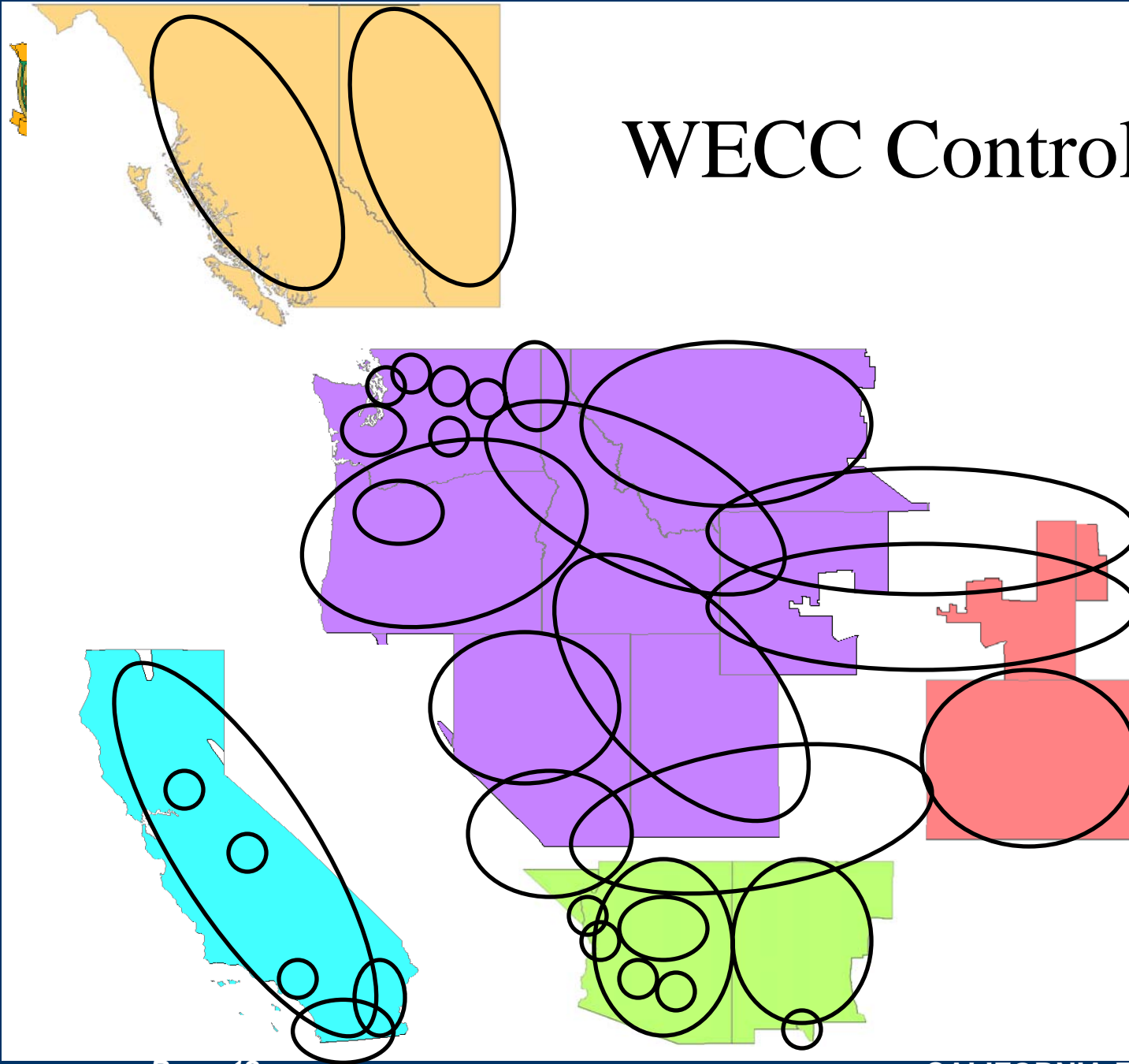
- Information on future changes in TTCs due to planned upgrades to bulk transmission upgrades tends to come from trade press
- CAOs tend to focus on local areas, impacts of smaller upgrades, but ad hoc interregional groups may do analysis of larger projects.
- Vendors may be slow to incorporate upgrades into their databases



# How many MW go from A to B?

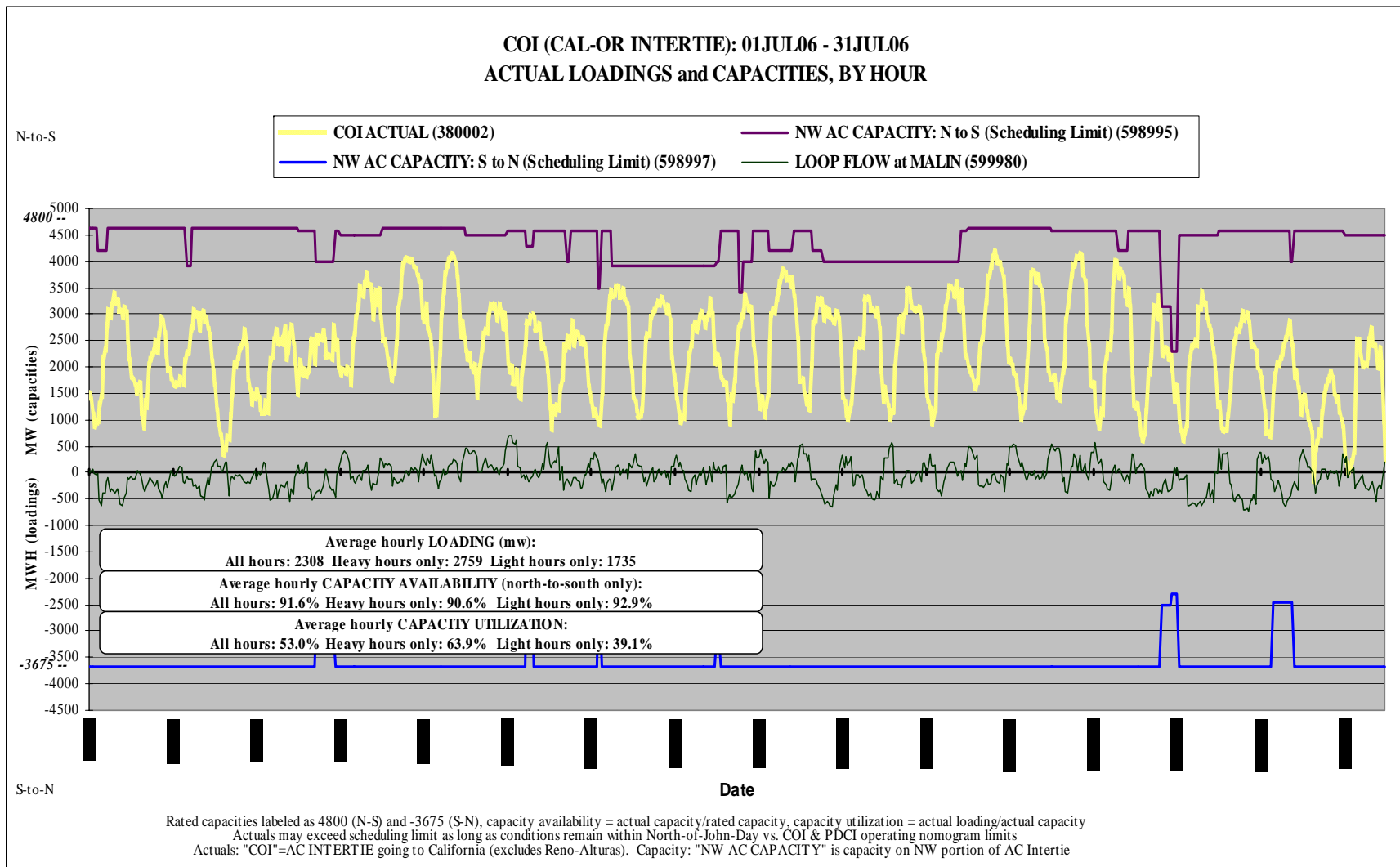
- Availability of historical data depends on whim of CAO; no reporting requirements or standards beyond annual aggregate values
- Vendors provide data for those transmission paths reported by CAOs.
- Helps to have CAO that is (quasi-)government entity

# WECC Control Areas





# Hourly Flows on COI





## More importantly...how many MW would like to go from A to B?

- Entitlement shares over major paths known and fixed, except...
- where traded, or auctioned, data tends not to be compiled by other than CAO.
- Congestion may be reported by CAO, vendor
  - Yes/No by hour, monthly and annual numbers
  - Congestion charges



# Transmission Outage Rates

- Used for stochastic reliability assessments; accurate data needed due to low probabilities of outages
- Information resides with control area operators
- Derate data is kept by CAOs for (major?) interchanges, but derates cannot be apportioned between forced outages and planned and deferrable maintenance.



# Transmission Access Charges etc

- Miscellaneous costs are available from CAOs, vendors
  - Transmission access charges (change annually)
  - Wheeling costs (ditto)
  - Transmission loss factors (stable)



# Transmission Upgrade Costs

- Survey Data is Available?
- From PUCs (cost recovery for specific projects), guesstimates in IRPs?
- Outdated historical costs vs. unrealistic projected costs (time lag problem)
- Sensitivities
  - Temporal (inflation)
  - Geographic (land, labor cost differentials)
- Project Specificity
  - e.g., new corridors vs. expansion



# Obstacles to Improved Data Availability

- Balkanization of grid, limited need for data
- Lack of collection efforts on the part of Coordinating Councils
- Lack of reporting requirements for control area operators
- Deregulation, more data held as market sensitive
- 9/11!, 9/11!, 9/11! (terrorists, terrorists everywhere!)



# Suggestions for Further Research

- “RTOs” provide better data than traditional CAOs
  - Independence
  - Need for more information
- Annual reports of RTOs are a good source of aggregate data, summary statistics
- “The price of data is eternal vigilance”